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Global Model for 8-inch Czochralski Silicon Crystal Growth Process

Q. S. Chen *, G. Y. Deng

[1] *Institute of Mechanics, Chinese Academy of Sciences, 15 Bei Si Huan Xi Road, Beijing 100080, China*
Email: qschen@imech.ac.cn

Abstract

Czochralski method is a dominant method for the silicon single crystal growth. We simulated the melt flow and temperature distribution in an 8-inch silicon Czochralski furnace with a cusp magnetic field by using a finite volume method. We focused on the melt flow in the crucible, which is a result of the competition of buoyancy, the centrifugal forces caused by the rotations of the crucible and crystal, the thermocapillary force on the free surfaces and the Lorentz force induced by the cusp magnetic field. The zonal method for radiative heat transfer is used in the growth chamber, which is confined by the crystal surface, melt surface, crucible, heat shield, and pull chamber. The melt flow in the crucible is shown in Fig. 1 for Hartmann number of 20. By using the cusp magnetic field, the flow oscillation can be depressed.

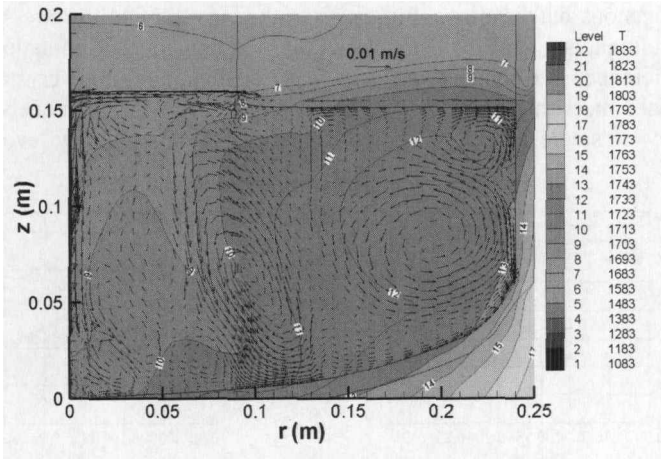

Figure 1: Flow pattern and temperature distribution in the crucible for Hartmann number of 20

REFERENCES

1. Hicks TW, Organ AE, Riley N. Oxygen transport in magnetic Czochralski growth of silicon with a non-uniform magnetic field. J. Crystal Growth,1989; **94**: 213.